A SKULL FRAGMENT OF THE CRETACEOUS CHELONIID TURTLE *OSTEOPYGIS* FROM ATLANTIC HIGHLANDS, NEW JERSEY

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Abstract

A turtle skull fragment including the prefrontal and frontal bones is described from the basal Navesink greensand (about earliest Maastrichtian, Late Cretaceous) at Atlantic Highlands, Monmouth County, New Jersey. It represents a large individual (skull originally ca. 38 cm long) of the cheloniid sea-turtle *Osteopygis emarginatus* Cope. Although skull material is rare, the genus *Osteopygis* is relatively common in Upper Cretaceous deposits of the Atlantic Coastal Plain.

Introduction

The skull fragment described here was collected in April of 1985 by Ralph Johnson, president of the Monmouth Amateur Paleontologists Society, who generously donated it to the New Jersey State Museum (NJSM 12921). Its source was the bluff of greensand marl facing Sandy Hook Bay, about 1 mile east of the marina at Atlantic Highlands, Monmouth County, New Jersey. This locality and the stratigraphy of the source bed are discussed by Cobban (1974) in a paper on ammonites collected by members of the Monmouth Amateur Paleontologists Society. The turtle fossil was found within one meter of the base of the Navesink Formation of Late Cretaceous age; it may be either very late Campanian or very early Maastrichtian. As Cobban notes, "A late Campanian assignment is slightly favored from the molluscan evidence, although a Maestrichtian age is suggested by the planktonic Foraminifera."

Description

The specimen (Fig. 1) consists of the left prefrontal and frontal bones of the skull, closely united by a well-defined suture. On its anterolateral edge the prefrontal shows an accordion-pleated sutural surface for articulation with the maxilla; its anterior end, including the margin of the external nostril, is broken away. On the medial surface (Fig. 1 C) this break essentially coincides with the suture between prefrontal and frontal. The frontal was evidently a long bone although its postero-lateral portion is broken off. It

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forms part of the orbital margin and sends a wedge-shaped process forward between the prefrontals. The inter-frontal suture that forms its medial margin must have extended opposite most of the length of the orbit, leaving only a short length of suture to connect the prefrontals at their anterior ends, directly behind the narial opening.

On the dorsal surface (Fig 1 B) can be seen three round-bottomed grooves or sulci that mark the margins of the horny epidermal scutes that covered the skull in life. A sagittal sulcus extends back to a level opposite the posterior end of the prefrontal, where it bends postero-laterally and meets (just at the broken edge) a sulcus that courses antero-laterally to the orbital margin. From the point of juncture a parasagittal sulcus must have extended back across the posterior margin of the frontal, as is the case in the best-preserved skull of *Osteopygis* (Fastovsky, 1985, fig. 2).

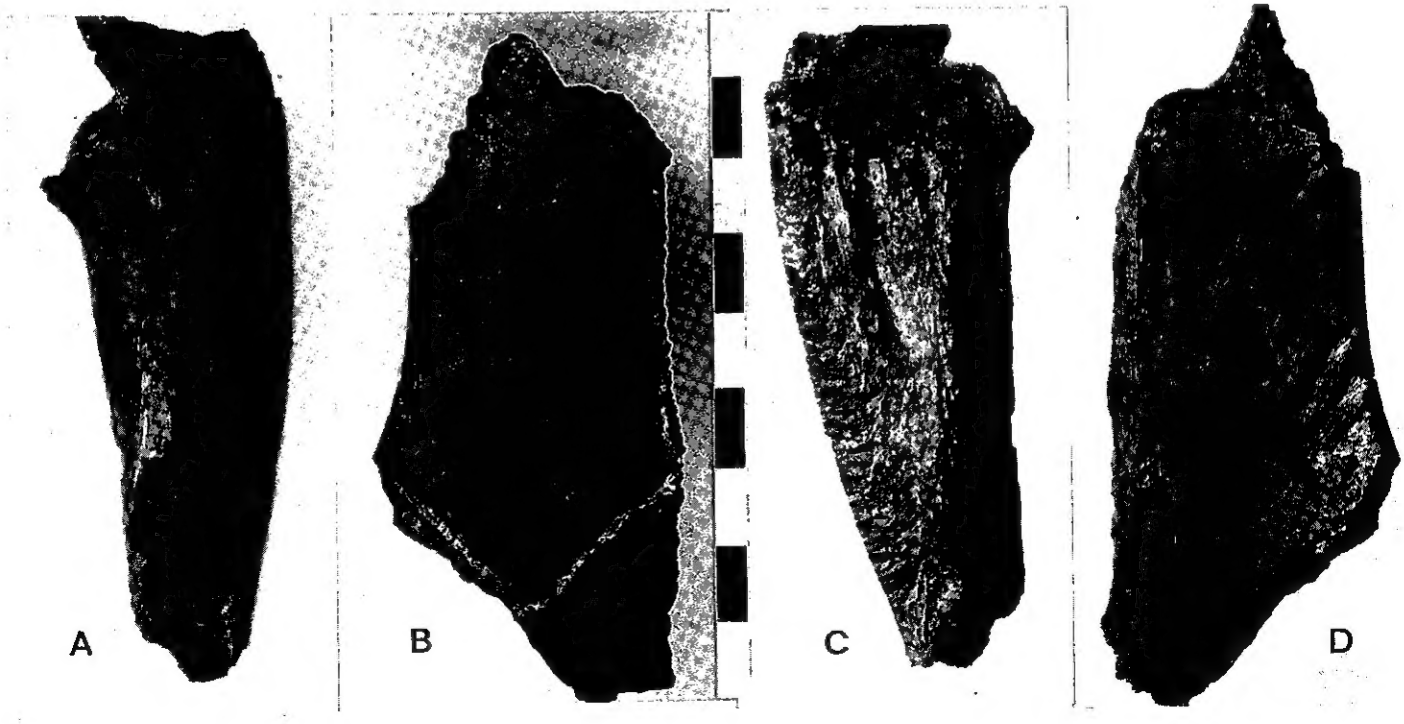

Figure 1. ***Osteopygis emarginatus*****, incomplete left prefrontal + frontal in lateral, dorsal, medial, and ventral views (NJSM 12921). Inter-scute sulci whitened. Scale in centimeters.**

Identification

The skull fragment from Atlantic Highlands conforms in every morphological feature with a excellent skull of *Osteopygis emarginatus* Cope (1868) from the basal, latest Cretaceous member of the Hornerstown Formation at Sewell, Gloucester County, New Jersey. The recent description and illustration of this skull (NJSM 11872) by Fastovsky constitutes a major additon to our knowledge of the cranial anatomy and taxonomic position of *Osteopygis*. Only two other skull specimens of the genus have been published: a snout fragment (YPM 913a) from the basal Hornerstown Formation (latest Maastrichtian) of Hornerstown, Monmouth County, New Jersey (Wieland, 1904, fig. 2, as "*Lytoloma angusta*?"; Zangerl, 1953, p. 212, fig. 61); and a crushed skull (UCMP 123616) from the Moreno Formation (Maastrichtian) of Fresno County, California (Foster, 1980). An additional, unpublished specimen (for information on which I am indebted to Dr. Robert E. Weems) consists of the anterior part of a palate from Hampton Mall in Prince Georges County, Maryland. Weems (personal communication) attributes the Maryland specimen to the Brightseat Formation of early Paleocene age, but it should be noted that most of the bone recovered from the Hampton Mall excavation comes from the Severn Formation of middle Maastrichtian age (see Baird, 1986, this issue); the Severn sample includes a diagnostic carapace fragment of *Osteopygis emarginatus* (USNM 336472). It seems probable, then, that the Maryland skull fragment is Maastrichtian, like the California specimen and all the *Osteopygis* material from New Jersey for which we have adequate stratigraphic information.

Figure 2 shows the area occupied by the fragment from Atlantic Highlands on a diagram of the skull of *Osteopygis emarginatus* that is based primarily on NJSM 11872 and YPM 913a.

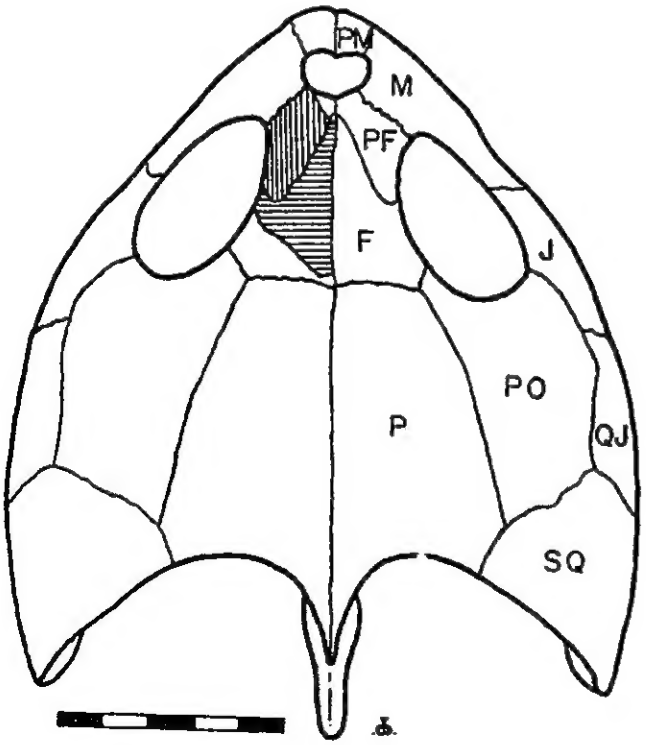

Figure 2. Skull diagram of *Osteopygis emarginatus* based on NJSM 11872 and YPM 913a, with position of NJSM 12921 shaded. Abbreviations: F – frontal, J – jugal, M – maxilla, P – parietal, PF – prefrontal, PM – premaxilla, PO – postorbital, QJ – quadratojugal, SQ – squamosal. Centimeter scale applies to NJSM 11872 from Sewell, New Jersey.

Size

A rough estimate of the original size of the skull represented by NJSM 12921 can be obtained by extrapolation from NJSM 11872. On the specimen from Atlantic Highlands the minimum transverse distance from the orbital margin to the mid-sagittal suture is 34.5 mm, so (assuming perfect symmetry) the interorbital width of the skull roof was 69 mm. On the skull from Sewell the corresponding measurement is 30 mm. Assuming that allometric growth was negligible within the adult size-range, by slide-rule extrapolation we get 380 mm as the approximate overall length of the skull of which NJSM 12921 is a fragment, as compared with 165 mm for the skull from Sewell and 145 mm for the California skull. Clearly the specimen from Atlantic Highlands represents an extremely large individual, perhaps the largest *Osteopygis* yet known. For lack of association

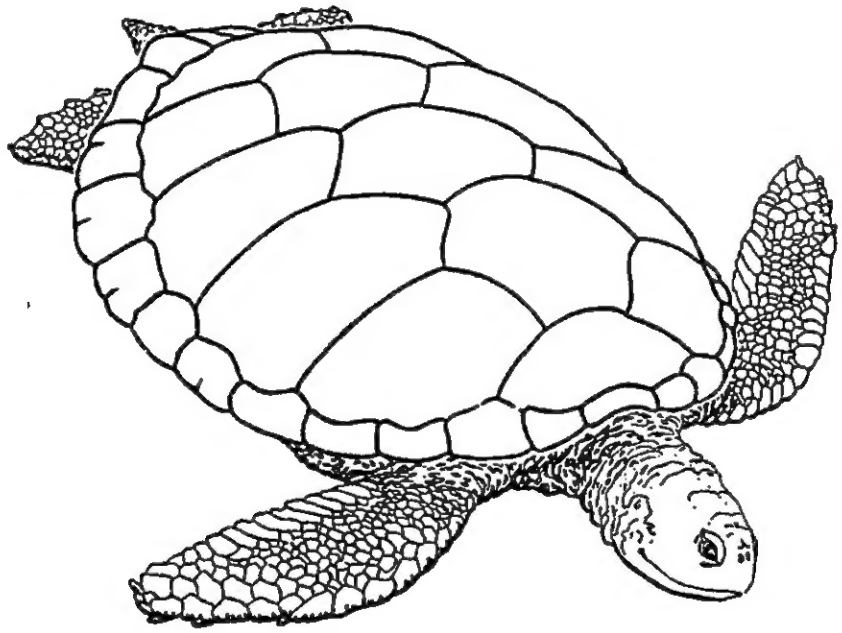

Figure 8. Life restoration of *Osteopygis* by Allan Thomas (from Fastovsky, 1985, courtesy of the New Jersey State Museum).

between skulls and shells, however, we have no way of estimating the body size of this turtle when it was alive.

Classification

In his original description of the genus *Osteopygis* Cope (1868) assigned it to the Cheloniidae, the family that includes most of the living sea-turtles. In 1953 Zangerl transferred it to the Toxochelyidae, an extinct family best represented in the Cretaceous, and established the subfamily Osteopyginae. In 1985 Fastovsky carried out a cladistic analysis of this group of turtles and concluded that, on balance of characters, the Osteopyginae (*Osteopygis* and the Eocene genus *Erquelinnesia*) show closest affinities with the Cheloniidae. Fastovsky's arguments need not be repeated here, but his conclusions are expressed taxonomically as follows:

Class REPTILIA, Order CHELONIA, Suborder CRYPTODIRA

Superfamily CHELONIOIDEA, Family CHELONIIDAE, Subfamily OSTEOPYGINAE

Genus *Osteopygis* Cope, 1868

Osteopygis emarginatus Cope

The specimen from Atlantic Highlands adds no information bearing on the question of classification, as the only major character it displays is the lateral extension of the frontal bone to form a large sector of the orbital margin. It may be noted that this character-state is present in all toxochelyids in which the skull is known; the same is true of early cheloniids such as *Desmatochelys* (Cretaceous) and *Puppigerus* (Eocene) and all the living genera except *Caretta*. In the latter genus the prefrontal extends posterolaterally to articulate with the postorbital, excluding the frontal from the orbit—obviously a derived condition (Gaffney, 1979).

Acknowledgements

This paper records another of Ralph Johnson's many contributions to the paleontology, invertebrate and vertebrate, of the Atlantic Coastal Plain—contributions that have earned his name a lasting place in the literature. I am indebted to the New Jersey State Museum for the loan of comparative material, and to David E. Fastovsky, Eugene S. Gaffney, David C. Parris, and Robert E. Weems for helpful comments and criticisms. This research was supported by the William Berryman Scott Fund of Princeton University. The specimens cited are deposited in the following institutions:

NJSM New Jersey State Museum, Trenton
UCMP University of California Museum of Paleontology, Berkeley
USNM National Museum of Natural History, Washington
YPM Peabody Museum of Natural History, Yale University, New Haven

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